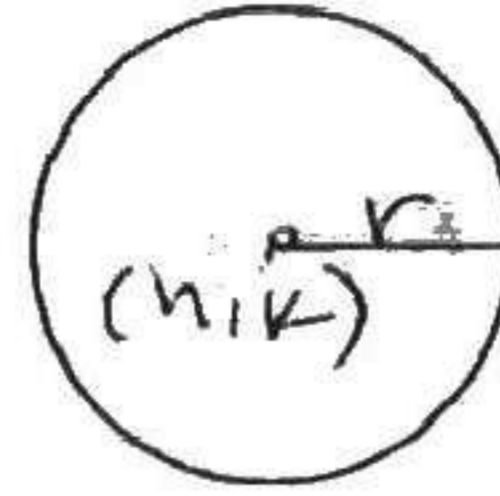


Review: A circle is the set of all points in a plane equidistant from a given point.

Standard Form for an Equation of a Circle:

The equation of a circle with center (h, k) and radius r is

$$(x-h)^2 + (y-k)^2 = r^2$$



General Form for an Equation of a Circle:

$$x^2 + y^2 + ax + by + c = 0$$

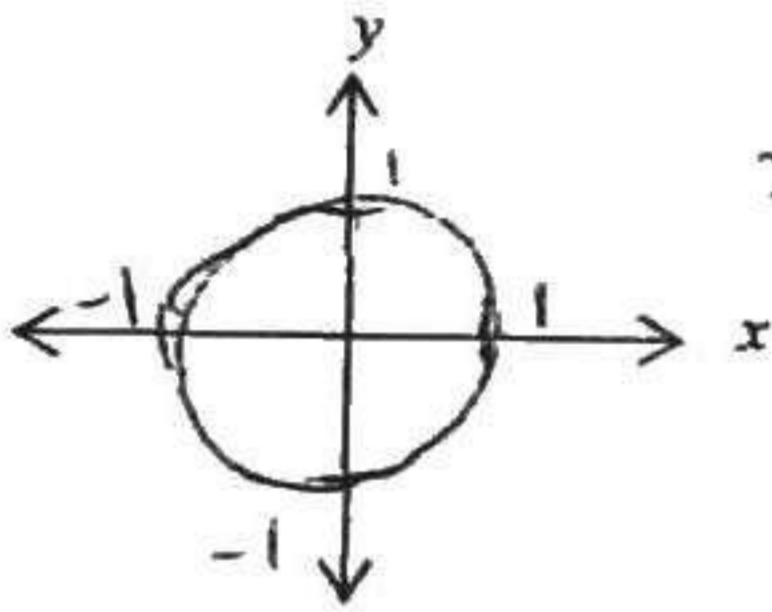
When in this form, you can complete the square to find the standard equation.

Looking ahead:

The standard form of an equation of a circle of radius r with center at the origin $(0, 0)$ is $x^2 + y^2 = r^2$.

If the radius $r = 1$, the circle whose center is at the origin is called the unit circle and has the equation $x^2 + y^2 = 1$.

Sketch and label the unit circle.



This graph is symmetric to the x-axis, y-axis, and origin.

This will be a MAJOR concept next semester!

Examples:

1. Determine the center and the radius of each circle.

a) $(x-4)^2 + y^2 = 81$

$C(4, 0), r = 9$

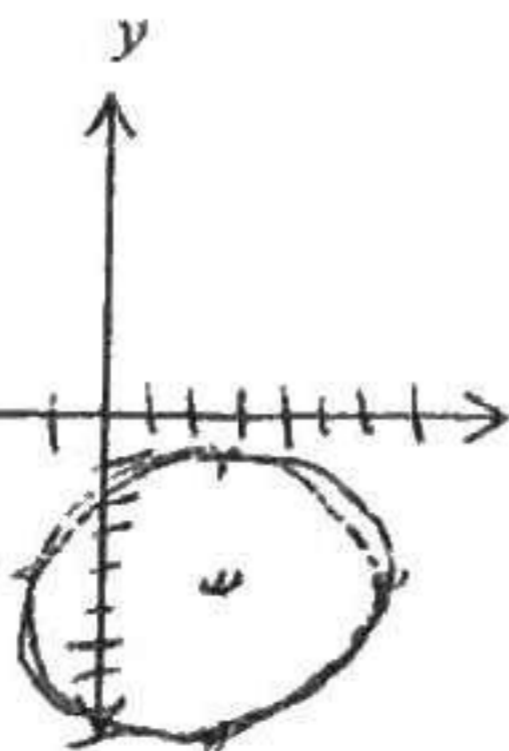
b) $(x-5)^2 + (y+6)^2 = 45$ $\sqrt{45}$

$C(5, -6), r = 3\sqrt{5}$

2. Write the standard equation of the circle that has the given center and radius. Graph.

a) center $(3, -5)$; radius 4

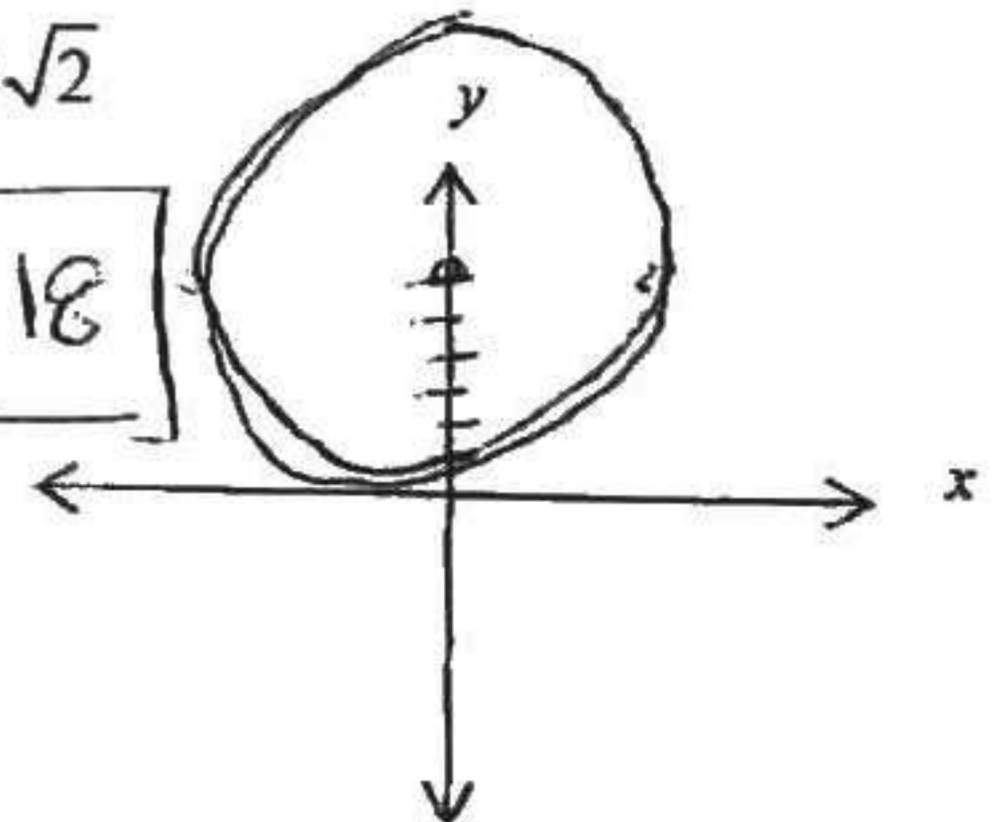
$$(x-3)^2 + (y+5)^2 = 16$$



b) center $(0, 6)$; radius $3\sqrt{2}$

$$x^2 + (y-6)^2 = 18$$

$$(3\sqrt{2})^2$$



3. Write the standard equation of the circle by *completing the square*. Then identify the center and the radius.

a) $x^2 + y^2 + 6x - 14y - 42 = 0$

$$x^2 + 6x + 9 + y^2 - 14y + 49 = 42 + 9 + 49$$

$$\boxed{(x+3)^2 + (y-7)^2 = 100}$$

$C(-3, 7) \quad r=10$

b) $-2x^2 + 24x + 4y = 2y^2 + 72$

$$x^2 + 12x + 2y = y^2 + 36$$

$$x^2 + 12x + 36 + y^2 - 2y + 1 = -36 + 36 + 1$$

$$\boxed{(x+6)^2 + (y-1)^2 = 1}$$

$C(-6, 1) \quad r=1$

4. A circle has diameter with endpoints $(8, -3)$ and $(2, -1)$. Find

a) the center of the circle

$$M\left(\frac{8+2}{2}, \frac{-3-1}{2}\right)$$

$$\boxed{C(5, -2)}$$

b) the radius

$$d = \sqrt{(5-8)^2 + (-2+3)^2}$$

$$= \sqrt{9+1}$$

$$\boxed{r = \sqrt{10}}$$

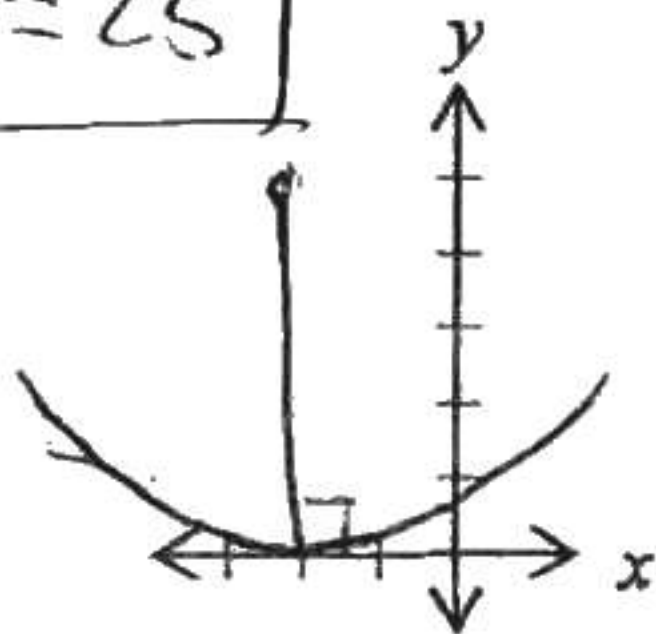
c) the equation of the circle

$$\boxed{(x-5)^2 + (y+2)^2 = 10}$$

5. Write the equation for the circle with the given characteristics. Use a graph to show your reasoning.

Center $(-2, 5)$ tangent to the x -axis.

$$\boxed{(x+2)^2 + (y-5)^2 = 25}$$



Center on the line $y = 3x$ tangent to the y -axis at 6.

$$\boxed{(x-2)^2 + (y-6)^2 = 4}$$

